

INFLUENCE OF SATELLITE Io ON THE 26.3 MC/S EMISSIONS FROM JUPITER

Observational data (Douglas, 1960; Carr et al., 1961) identify decametric radio emissions from Jupiter with three regions in system III longitude - region 1 ($40^\circ < \lambda_{III} < 180^\circ$), region 2 ($180^\circ < \lambda_{III} < 270^\circ$), and region 3 ($270^\circ < \lambda_{III} < 345^\circ$). More recently, observations of the decametric radio emissions from Jupiter have been shown to suggest that the probability of emission is influenced by the position of Jupiter's satellite Io in its orbit. In particular, data obtained with the swept-frequency dynamic spectrograph at the High Altitude Observatory from 1961 to 1964 have been interpreted to show that the probability of emission is highest when Io is near 90° or 240° from superior geocentric conjunction and near the plane containing Jupiter's magnetic axis and the axis of rotation ($\lambda_{III} \sim 200^\circ$). (Bigg, 1964; Dulk, 1964). Observations of Jupiter in 1963 and 1964 with the 26.3 Mc/s array of the Clark Lake Radio Observatory at Clark Dry Lake, California, have been examined to assess the possible influence of Io on these results, and we wish to report that there is a possible correlation of the Clark Lake data with the position of Io. Since the technical details of the observations have been discussed elsewhere (Stone et al., 1964) this communication will be concerned only with the results as they pertain to the influence of the satellite Io.

Figure 1 shows the number of 26.3 Mc/s events observed

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as a function of the position of Io in its orbit measured from superior geocentric conjunction. The data in Figure 1 represent a total observing period of about two months as opposed to a period of nearly four years for the HAO data, and yet an apparent increase in the occurrence probability when the departure of Io from superior geocentric conjunction is near 90° or 270° is still easily seen. The data are broken into three groups corresponding to the three decametric regions in system III longitude. Over 66 percent of all 26.3 Mc/s events associated with region 1 ($40^\circ < \lambda_{III} < 180^\circ$) were observed when Io was between 60° and 90° from superior geocentric conjunction. Of the noise events occurring in region 2 ($180^\circ < \lambda_{III} < 270^\circ$), 52 percent were observed when the position of Io was between 200° and 270° . Similarly, 55 percent of the events associated with region 3 ($270^\circ < \lambda_{III} < 345^\circ$) occurred when the position of Io was between 200° and 270° from superior geocentric conjunction. The data in Figure 1 are for all events stronger than 10^{-23} W/m²/cps, the sensitivity of the Clark Lake observations. If one considers only those events of flux densities exceeding 5×10^{-22} W/m²/cps, however, 57 percent of the events are found to occur when Io was between 60° and 90° , and 56 percent of the events fall in the interval for Io's position being between 200° and 270° from superior geocentric conjunction.

In summary, the Clark Lake observations tend to confirm the apparent influence of Io on the 26.3 Mc/s emissions from

Jupiter and show an enhanced probability of emission when Io is near 80° or 230° from superior geocentric conjunction. The first emission region on Jupiter appears to be associated with the 80° peak in the position of Io; whereas the two later regions have a high probability of emission when Io is near 230° .

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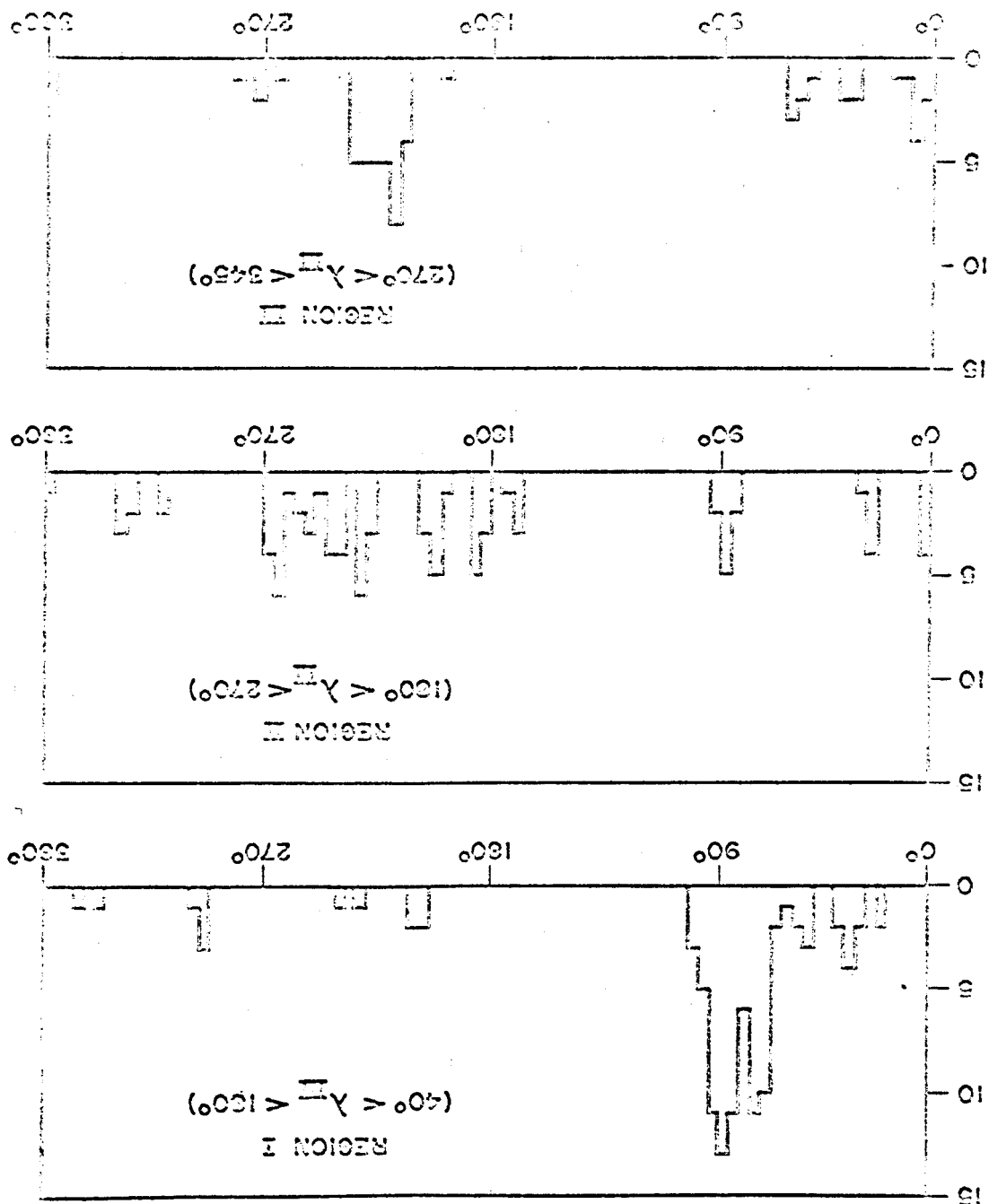
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FIGURE CAPTION

Fig. 1. Number of 23.3 Mc/s noise events observed as a function of the departure of Io from superior geocentric conjunction.

NUMBER OF 20.3 Mc/s EVENTS

DERIVATIVE OF λ FROM SUPERIOR GEOMETRIC CONSTRUCTION



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